

In re applicati n: Jun Zheng
Filed: 08/16/2001
Response Dated 05/12/2003

PAGE 3 OF 9

Serial No.: 09/931,669
Attorney's Docket: PAT036US
Reply to Office action of 02/12/2003

LISTING OF CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- A2
1. (currently amended) A device laser structure, comprising:
a substrate;
a bottom mirror disposed on the substrate;
an active region layer comprising an active region and active region layer portions
outside the active region, the active region layer portions outside the active region
having a top surface, an the active region having a bottom and a top surface, wherein
the active region is adapted to be optically pumped and is disposed at its bottom
surface on the substrate bottom mirror and the active region is for emitting light
generated therein out of its top surface; and
a heat-spreading layer disposed directly on a the top surface of the active region and in
contact with material on the top surface of the active region layer portions outside the
active region, for removing whereby some of the heat generated in the active region
during optical pumping thereof is conducted from the top surface of the active region
into the active region layer portions outside the active region via the heat-spreading
layer.
 2. (canceled)
 3. (currently amended) The device laser structure of claim 2 1, wherein the heat-spreading layer has a thickness between about 1 μm and 4 μm .
 4. (currently amended) The device laser structure of claim 3, wherein the heat-spreading layer consists of InP.
 5. (canceled)

In re application: Jun Zheng
Filed: August 16, 2001
Response Dated 05/12/2003

PAGE 4 OF 9

Serial No.: 09/931,669
Attorney's Docket: PAT036US
Reply to Office action of 02/12/2003

12

6. (currently amended) The ~~device~~ laser structure of claim 5 1, ~~wherein the further comprising a second~~ heat-spreading layer is disposed directly on the bottom surface of the active region, between the active region and the bottom mirror.

7. (currently amended) The ~~device~~ laser structure of claim 5, further comprising a top mirror disposed on above the ~~active region~~ heat-spreading layer such that the active region is interposed between the first reflector and the second reflector, ~~wherein the device is a laser device.~~

8. (canceled)

9. (currently amended) The ~~device~~ laser structure of claim 8 7, further comprising a second heat-spreading layer disposed on the bottom surface of the active region, between the active region and the bottom mirror.

10. (currently amended) The ~~device~~ laser structure of claim 8 7, wherein the heat-spreading layer has a thickness between about 1 μm and 4 μm .

11. (currently amended) The ~~device~~ laser structure of claim 10, wherein the heat-spreading layer consists of InP.

12. (canceled)

13. (currently amended) The ~~device~~ laser structure of claim 8, wherein the top mirror comprises a top distributed Bragg reflector (DBR) and the bottom mirror comprises a bottom DBR.

14. (currently amended) The ~~device~~ laser structure of claim 8 13, wherein:
the top and bottom DBRs are for at least partially reflecting light at a wavelength and the active region is for generating light at the wavelength; and

In re application: Jun Zheng
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Response Dated 05/12/2003

PAGE 5 OF 9

Serial N.: 09/931,669
Attorney's Docket: PAT036US
Reply to Office action of 02/12/2003

A2
the heat-spreading layer is substantially transparent to light at the wavelength.

15. (currently amended) The ~~device~~ laser structure of claim 13, wherein the top DBR comprises a dielectric top DBR and the bottom DBR comprises a semiconductor bottom DBR, wherein the heat-spreading layer has a thermal conductivity greater than that of the top DBR and greater than that of the bottom DBR.

16. (canceled)

17. (currently amended) The ~~device~~ laser structure of claim 16, wherein the top mirror is mounted above the heat-spreading layer with a gap between the top mirror and the heat-spreading layer, wherein the ~~bottom mirror, active region, top mirror, and heat-spreading layer form laser structure comprises~~ a vertical external-cavity surface-emitting laser.

18. (canceled)

19. (canceled)

20. (currently amended) The ~~device~~ laser structure of claim 1, wherein the active region is layer one of comprises an array of active regions, including the active region, the active region layer being disposed at a bottom surface thereof on the bottom mirror, wherein the heat-spreading layer is disposed directly on the top surface of each active region of the array and on active region layer portions outside each active region of the array being disposed at its bottom surface on the substrate and having the heat-spreading layer disposed on a surface of said each active region.

21. (currently amended) A ~~device~~ laser structure, comprising:
a substrate means;
a bottom mirror means disposed on the substrate;

In re application: Jun Zheng
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Response Dated 05/12/2003

PAGE 6 OF 9

Serial No.: 09/931,669
Attorney's Docket: PAT036US
Reply to Office action of 02/12/2003

12
a gain means layer disposed on the bottom mirror means and comprising a gain means
for emitting light generated therein out of a top surface of the gain means when the
gain means is optically pumped, the gain means layer further comprising gain means
layer portions outside the gain means; and

a heat-spreading means disposed on a top surface of the gain means on a top surface of
the gain means layer portions outside the gain means for removing heat from the
active-region gain means by conducting said heat from the top surface of the gain
means, through the heat-spreading means, and into the gain means layer portions
outside the gain means.

22. (canceled)

23. (currently amended) A method for removing heat from an active region of a device laser
structure, comprising the steps of:

optically pumping generating light with the active region and emitting said so that it
generates heat and light, the light being emitted out of a top surface of the active
region, wherein the active region has a bottom and a top surface and is part of an
active region layer comprising the active region and active region layer portions
outside the active region, the active region layer portions outside the active region
having a top surface; and

removing, with a heat-spreading layer disposed directly on the top surface of the active
region and on the top surface of the active region layer portions outside the active
region, some of the heat from the active region with a heat-spreading layer disposed
on a surface of the active region and in contact with material outside the active
region by conducting said heat from the top surface of the active region, through the
heat-spreading means, and into the active region layer portions outside the active
region.